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APPARATUS AND PROCESS FOR APPLYING MARKINGS
ON A MINERAL FIBER PRODUCT
[Vorrichtung und Verfahren zum Aufbringen von Markierungen
auf ein Mineralfaserprodukt]

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APPARATUS AND PROCESS FOR APPLYING MARKINGS ON A MINERAL FIBER

PRODUCT

Apparatus for applying markings on a mineral fiber product comprising: an essentially plate-shape configured stamp block (12), on which heating elements (14) are arranged, which can be brought into contact with the mineral fiber product (44), wherein the stamp block (12) can be guided vertically to and essentially together with the moving mineral fiber product (44) so as to move step-by-step along with the mineral fiber product (44).

The mineral fiber product (44) lies on the transport means and is conducted at a constant transport speed.

The stamp block is hinge-connected with at least two respective flyweights (32), and the flyweights (32) are in turn fixedly connected against rotation with a drive shaft (34) and are placed in rotational motion via a drive.

The drive of the flyweight is connected in such a way to the control apparatus, that the stamp block is conducted while in contact with the mineral fiber product at a constant speed in the transportation direction of the mineral product.

¹ Numbers in the margin indicate pagination in the foreign text.

Description

The invention concerns an apparatus and a process for applying markings on a mineral fiber product.

Mineral fiber products such as mineral fiber strips or mineral fiber plates are provided with markings to allow the user a dimensionally accurate cutting through of the mineral fiber products or to provide the mineral fiber product with brand name or type identifications.

To prevent a dye application with relatively complicated application technique and possibly an influencing of the fire behavior, a marking of this kind is produced in this technology, preferably by weld penetration. Therefore, the mineral fiber product is brought into contact either with a heating element, a directional flame, or a hot air stream, whereby the bonding agent heats in the heating zone up to its decomposition temperature and is discolored thereby. The mineral fiber product is not weakened thereby, because the effect of the heat treatment is only limited to the surface area.

From European patent publication 0,244,035 is known an apparatus for applying marking lines. A roller is mounted on a shaft and has heating rods arranged axis-parallel at the circumference, which are electrically heated via a heating device. The shaft of the roller is mounted on a liftable and lowerable storage rack driven by an electromotor. An electromotor with a free wheel is preferably used, whose free

wheel allows an overdrive of the motor as soon as the roller comes to lie on the mineral fiber product and is driven thereby at increased speed.

While simple geometric markings such as, for example, marking lines, can be produced in a simple manner via a targeted arrangement of the heating elements on the marking roller according to European patent publication 244,035, with complicated geometric shapes such as, for example, company emblems or brand name identifications, is presented the difficulty that these must be arranged on the marking roller in the form of heating elements in such a way that after unrolling of the same is produced the desired image. Also the size of a complicated configured marking such as, for example, a company emblem, is limited by the circumference of a marking roller. Finally, on a curved surface, as is the case in the circumferential surface of a marking roller, a good dimensional accuracy between the heating elements can be obtained only with a great effort.

Based on European patent publication 0,244,035, the object of the invention is to provide a marking apparatus on which the shape to be marked can be arranged without distortion in the form of suitable heating elements.

This technical problem is solved by an apparatus for the application of markings on a mineral fiber product or a mineral fiber plate with the features of claim 1 as well as a process according to the features of claim 11.

By configuring the stamp block on which the heating elements are arranged essentially in the shape of a plate, the markings which are to be imprinted on the mineral fiber strip or mineral fiber plate such as, for example, symbols, can be configured without distortion on the stamp block. The stamp block is not arranged fixed on one location, but is movably guided, so that it can move essentially step-by-step with the moving mineral fiber product. In this way, during the contact time between the stamp block and the mineral fiber product to be imprinted, the stamp block can be moved essentially at the same speed as the moving mineral fiber product and heat can be transmitted, at the same time, onto the surface of the mineral fiber product.

The preferred embodiments of the invention are characterized by the features of the other claims.

The mineral fiber product rests advantageously on a transport means and is guided at a constant transport speed. This facilitates the coordination of the motion of the stamp block with the speed of the mineral fiber product, so that markings can be obtained which are free of distortion and have sharp contours.

The heating elements are preferably electrically heatable, wherein one or several flexible cables for the transmission of current to the heating elements can be attached to the stamp block. Differently as when using a rotating marking element, such as a marking roller, the electric energy to be supplied for the heating of the heating elements must not be transmitted over

slip rings, but can be simply and comfortably transmitted from the voltage source to the stamp block in the form of a suitable transmission connector with a flexible cable connected thereto.

The stamp block is preferably hinge-connected to at least two flyweights and the flyweights are fixedly connected against rotation to a drive shaft and are displaced by a drive in a rotating motion. By way of the articulated installation at the flyweights, which are in turn displaced by a drive shaft into rotating motion, the stamp block is moved up and down relative to the surface of the mineral fiber product to be imprinted as well as also step-by-step in the transport direction of the mineral fiber product. In this way, it can be achieved that, on the one hand, the stamp block with the heating elements arranged thereon is moved together with the mineral fiber product to be imprinted while it is brought into contact with the same and, on the other hand, in the case of a constant transport speed of the mineral fiber product, a marking can be applied at regular /3 preset intervals. Finally, the spatial alignment of the stamp block with the heating elements remains constant during the rotation of the fly wheels, so that the heating elements face toward the mineral fiber product to be imprinted during each motion phase of the stamp block. In this way, it is possible to transmit the energy required for heating the heating elements in the form of electric energy or steam via a flexible line to the stamp block, because the stamp block itself does not carry out a rotating motion.

The flyweights preferably have a counterweight whose center of mass with respect to the drive shaft is arranged opposite to the articulated connection of the stamp block and the fly wheel. In this way, the wear of the drive shaft of the flyweights as well as also of the drive can be considerably reduced, because no imbalance occurs at the rotation of the drive shaft remains constant. required for the rotation of the drive shaft remains constant.

According to a preferred embodiment, the drive of the flyweights is connected to a control apparatus. In this way, the motion of the stamp block is controlled by presetting a transport speed of the mineral fiber product to be imprinted so that, during the heat transmission process when the stamp block makes contact with the mineral fiber product, the stamp block is guided at the same speed as the mineral fiber product to be marked.

The control apparatus preferably rotates the drive shaft connected thereto, so that the stamp block has a constant speed in the transport direction of the mineral fiber product while it is in contact therewith. For this purpose, the rotation speed of the drive shaft can be slightly or specifically delayed while the stamp block is pressed into the mineral fiber product to be marked, and the rotation speed of the drive shaft can be again slightly accelerated during the following upward directed motion of the stamp block. By way of this measure is held constant the corresponding speed component of the stamp block, which is directed parallel to the transport direction of the mineral fiber product to be marked.

The invention will be described in the following purely as an example in view of the attached figures, wherein:

- Fig. 1 shows a lateral view of the apparatus for applying markings on a mineral fiber product vertically to the motion direction of the mineral fiber product;
- Fig. 2 shows a section view along the line A-A of Fig. 1; and
- Fig. 3 shows a schematic illustration of the speed components of the stamp block with the heating elements during contact with a mineral fiber product.

Fig. 1 shows a lateral view of an embodiment of the apparatus for applying markings on a mineral fiber product. The apparatus, which is generally designated with the reference numeral 10, consists essentially of a stamp block 12, which has a plate shape. The stamp block is preferably made of metal, but can also be made of a suitable plastic material. Heating elements 14 are arranged in a suitable manner on the stamp block 12.

The heating elements 14 can be either integrated directly into the stamp block 12 or however preferably be removably connected thereto. In this way is possible a rapid modification of the apparatus for the different geometric forms to be marked, without having to exchange the entire stamp block. This is particularly then advantageous, when a type identification is to be applied on the mineral fiber product to be marked with the aid of the marking apparatus. When exchanging the produced mineral fiber product must merely be exchanged the corresponding heating

elements at the stamp block to be able to identify individually the different mineral fiber products.

The heating elements 13 are in the example inserted in a punch plate 16, which also contains bores for connecting the punch plate 16 to the stamp block 12 by means of screws 18 or other known attachment elements. The heating elements 14 project a few millimeters over the underside of the stamp block 12 with the punch plate 16 attached thereto, to specifically transmit the heat onto the mineral fiber product to be marked.

The heating elements can have any desired construction shape, which is adapted to the type of heating energy used. In the case of an electric heating of the heating elements, the heating elements are provided with a resistance wire, which carries the current, and in this way produces heat. The heat is conducted by means of a good heat-conducting material onto the heat transmission elements, which project over the lower surface of the punch plate 16. In the case of a heating of the heating elements via steam, pipelines carrying steam form the core of the heating elements. Also in this case, the generated heat is transmitted by using suitable good heat-conducting materials to those parts of the heating elements, which come into contact with the mineral fiber product to be marked.

In the case of a steam heating as well as also an electric heating of the heating elements, suitable provisions are made in the stamp block 12 to distribute and derive the energy carriers in the form of current or hot steam from a central receiving

point in the stamp block 12 to the corresponding heating elements 14. /4

In the embodiment shown in Fig. 1, the heating elements 14 are electrically heated. The electric energy is transmitted over a connector 20 to a flexible cable 22 connected thereto onto the stamp block 12 and is distributed from there to the corresponding heating elements 14.

The stamp block 12 is provided with attachment arrangements 24, which in the simplest case consist of an eye, which is fixedly connected to the stamp block 12, and which serves as accommodation for a shaft 26. The attachment arrangement 24 is preferably provided with roller and slide bearings.

At the stamp block 12 are provided at least two, but preferably, however, four or six attachment arrangements 24, which each receive a shaft 26, with which the stamp block 12 is rotatably connected to a respective flyweight 32. The flyweight is in turn connected against rotation to a drive shaft 34, wherein the usual and known measures of the technology for obtaining a shaft-hub connection fixed against rotation can be used. The drive shaft 34 of each flyweight 32 is connected in turn to a gear arrangement 36, wherein the gear arrangements 36 of several flyweights 32 are connected to each other by means of a cardan-shaft drive 38. The drive torque, which acts on a gear arrangement 35, is thereby uniformly transmitted to the other gear arrangement. The geometric shape of the flyweight is only

shown as an example in Fig. 1 and can be configured in different ways.

The flyweight 32 has a counterweight 40, which is configured as one piece with the flyweight or, however, is carried out by attaching suitable weights to the flyweight. The provision of suitable counterweights leads to a uniform rotation of the flyweights without the occurrence of an undesirable imbalance with the shaking of the flyweights as well as of the stamp block connected thereto, which can lead to an increased wear, an irregular marking on the mineral fiber product, or also to an undesirable noise development.

Fig. 2 shows a section through the apparatus shown in Fig. 1 along the line A-A. Fig. 2 shows therefore the apparatus for applying markings seen in or against the motion direction of the mineral fiber product to be marked.

The stamp block 12 is configured so wide, that it extends over the width of the produced mineral fiber product. In this way can be applied markings over the entire area of the surface of the produced mineral fiber product by a specific application of the heating elements 14.

The gear arrangement 36 is provided with an ingoing shaft 42, via which is introduced the torque from a connected motor or a connected control apparatus. For this purpose, the ingoing shaft 42 is connected against rotation to the drive device. As can be seen in Figs. 1 and 2, no rotation of the stamp block 12 with the heating elements arranged thereon takes place around one

of the flyweight axes of the stamp block 12 during a motion of the flyweight 32 and the operation of the apparatus connected thereto. It moves merely up and down in the viewing direction of Fig. 2. Therefore, it is possible to feed via a flexible connection 22, for example an electric cable, the energy required for the operation of the heating elements in a simple and comfortable way to the marking stamp. In the case of rotating heating elements, such as for example a marking roller, the electric energy must be transmitted via slip rings, whereby their susceptibility to failure is increased and the maintenance intervals become shorter.

As becomes clear from Figs. 1 and 2, the apparatus according to the shown embodiment has four flyweights, wherein each two flyweights are synchronized via a cardan-shaft drive 38 and two flyweights are driven by way of the ingoing shafts 42. In the same way, it is also of course possible to drive all the flyweights independently from each other or also to achieve via a suitable torque transmission that a stamp block with several flyweights attached thereon is moved by means of a single drive device. It is also conceivable to drive only the flyweight on one side of the stamp block, for example, the two flyweights shown in Fig. 1, and to move the flyweights arranged on the opposite-lying side passively therewith.

Fig. 3 shows schematically the path course of the marking stamp consisting of the stamp block and heating element

projecting from the underside of the stamp block and the punch plate during the contact with a mineral fiber product.

The mineral fiber product 44 moves within the frame of the production process with a constant speed v_x , which faces in the x-direction according to the convention decided with respect to the axis directions. Because of the eccentric rotatable attachment of the stamp block with the heating elements attached thereto to the flyweights results the path course 46 of a fixed point on the marking stamp, for example, the contact tip of a heating element 14. Via a suitable constant rotation speed of the drive shaft 34 of the flyweights 32 it can be achieved that a speed v_{1x} of the heating elements is generated, which is equal to the speed v_x of the mineral fiber product 44, within the contact area between the marking stamp and the mineral fiber product 44 identified with K in Fig. 3. This speed v_{1x} , however, is not constant within the entire contact area K, since the heating elements 14 move on a circular path and, in this way, /5
also a speed component of the heating elements directed in the y-direction is formed. This means that at a constant rotation speed of the drive shafts 34 within the contact area K is generated a changing speed component in the x-direction of the heating elements.

This can be countered in that the ingoing shaft or shafts 42 are connected to a suitable control apparatus (not shown), which leads via a slight delay or acceleration of the rotation speed within the contact area K to a constant and speed of the marking

stamp in the x-direction, which is also coordinated with respect to the speed of the mineral fiber product. To achieve this, the rotation speed of the drive shafts 34 after entering the contact area K can be specifically delayed until the point designated in Fig. 1 with A1" is reached. At this time point, the rotation speed of the drive shafts is the lowest and the marking stamp moves at the speed v_{1x} in the x-direction according to the speed of the mineral fiber product to be marked. In addition, the rotation speed can be again specifically increased, so that when leaving the contact area K, the speed v_2 is increased to such an extent that the speed component v_{2x} in the x-direction is again equal to the speed v_x of the mineral fiber product to be stamped.

By means of this measure it can be ensured that the marking stamp is moved within the entire contact area at a constant speed in the x-direction, coordinated with respect to the speed of the mineral fiber product.

By providing a planar marking surface can also be undertaken structurally complicated markings, without having to apply the same in the form of an unrolling on a rotating marking element. The stamp blocks with the heating elements integrated therein, or the punch plates with the heating elements arranged therein which can be attached to a stamp block, can be easily and comfortably handled and require in particular only a small space for storage.

The heating energy required for heating the heating elements can be transmitted to the stamp block by means of one or several flexible lines in that the marking stamp does not carry out a

rotational motion around one of its flyweights axes. A complicated transmission of the energy from the fixed to the rotating components is not needed. The marking stamp can be moved via a specific control of the rotation speed of the flywheels in such a way that the marking stamp is guided during the entire contact time with the mineral fiber strip or mineral fiber plate to be marked at a constant transport speed, which is to be coordinated with respect to the speed of the mineral fiber product.

Patent Claims

1. Apparatus for applying markings on a mineral fiber product comprising:
 - an essentially plate-shape configured stamp block (12), on which
 - are arranged heating elements (14), which can be brought into contact with the mineral fiber product (44), wherein
 - the stamp block (12) can be moved vertically to the moving mineral fiber product (44) and can essentially move step-by-step together with the mineral fiber product (44).
2. Apparatus for applying markings on a mineral fiber product according to claim 1, characterized in that the mineral fiber product (44) rests on a transport means and is guided at a constant transport speed.

3. Apparatus for applying markings on a mineral fiber product according to claim 1 or 2,
characterized in that
the heating elements can be electrically heated.
4. Apparatus for applying markings on a mineral fiber product according to claim 3,
characterized in that
at least one flexible cable (22) for the transmission of current is attached to the heating elements (14) at the stamp block (12).
5. Apparatus for applying markings on a mineral fiber product according to at least one of the preceding claims,
characterized in that
the stamp block is hinge-connected to at least two corresponding flyweights (32) and the flyweights are connected against rotation to a corresponding drive shaft (34) and are set into rotation motion via a drive.
6. Apparatus for applying markings on a mineral fiber product according to claim 5,
characterized in that
the flyweights (32) each have a counterweight (40), whose center of mass with respect to the drive shaft is arranged radially opposite to the articulated connection (24, 26) from the stamp block and the flyweight. /6
7. Apparatus for applying markings on a mineral fiber product according to claim 5 or 6,

characterized in that

the drive of the flyweights is connected to a control apparatus.

8. Apparatus for applying markings on a mineral fiber product according to claim 7, characterized in that the control apparatus displaces the connected drive shaft in such a way into rotation motion, that the stamp block is guided while in contact with the mineral fiber product at a constant speed in the transport direction of the mineral fiber product.
9. Apparatus for applying markings on a mineral fiber product according to one or several of the preceding claims 1 to 8, characterized in that the heating elements (14) are connected to a punch plate (16), which is releasably attached to the stamp block (12).
10. Apparatus for applying markings on a mineral fiber product according to claim 9, characterized in that the heating elements (14) project by a few millimeters over the surface of the punch plate (16) facing the mineral fiber product to be marked.
11. Process for applying markings on the mineral fiber product comprising the steps of:
 - moving the mineral fiber product to be marked on a transport means;

- moving a stamp block with heated heating elements on the surface of the mineral fiber product to be marked;
 - bringing the heating elements of the stamp block into contact with the mineral fiber product to be marked;
 - moving the stamp block while in the contact phase so that the stamp block moves essentially together with the mineral fiber product to be marked; and
 - removing the stamp block from the marked mineral fiber product.
12. Process for applying markings on a mineral fiber product according to claim 11, further comprising:
- moving the mineral fiber product to be marked with a constant transport speed; and
 - moving the stamp block while in the contact phase at an essentially constant speed in the transport direction of the mineral fiber product, which corresponds essentially to the transport speed of the mineral fiber product.